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WEATHER CAMERA, ACTION!

A METEOROLOGIST'S GUIDE TO THE SKY

REC

JET STREAMS

AN ATMOSPHERIC SUPERHIGHWAY

Imagine looking down on Earth from the deep darkness of space: its vast blue oceans, golden deserts, luscious forests, all topped and tailed by crisp, ice-covered poles.

But there's more. Clouds, and lots of them – big and small, swirls and blobs, bright and white – whizzing around on an atmospheric superhighway known as the jet stream.

Let's Get Moving!

Jet streams not only determine how and where weather systems form, but they also shift them around. For example, an area of cloud, rain and wind may start in eastern Canada, but could end up thousands of miles away in Europe – changing as it moves.

Hot Pursuit

Temperature differences in the **atmosphere** cause air to rise, fall and move around our planet, and it's the contrast between cold air at the poles and warm air at the **equator** that leads to jet streams.

The bigger the contrast, the faster the jet stream. Therefore, it moves fastest in autumn and winter, when the contrast between the increasingly cold poles and constantly warm equator gets bigger. In summer, it moves much slower, as the temperature contrast decreases.

Going My Way?

Planes can fly faster by hitching a ride on a jet stream. If they're moving in the same direction, the jet stream helps to carry the plane along and gives it a speed boost.

Don't Slow Down

Normally, jet streams smoothly flow around the Earth, keeping weather changeable. But when they bend too much, weather systems can slow down or even get stuck, causing spells of rain, snow, heat or cold that last for weeks or even months. This is how extreme weather can happen...

WIND

STIRRING THE AIR

Although we can't actually see the wind, we can see the big effect it has around us. But where does it all come from, and how does it move the weather?

Under Pressure

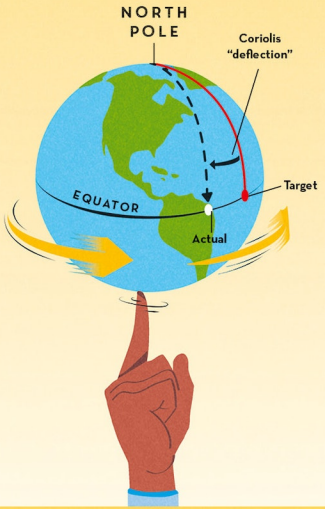
Wind is caused by differences in **air pressure**: the weight of air molecules pressing down on the ground. Imagine you're climbing a ladder: this is usually pretty easy, because nothing's pushing you down – that's low pressure. But if you tried to climb with a full backpack on, it would be much harder because it's pushing you down, and that's high pressure.

Areas of **high pressure** generally bring calm, settled weather. Air sinks towards Earth's surface, spreading outwards when it reaches the ground.

Areas of **low pressure** bring unsettled weather, and air rises upwards – away from Earth's surface.

Wind always blows from high to low pressure and it's this movement of air between them close to the surface that creates wind.

I often mention high and low pressure in my weather forecasts. It's a handy way to give everyone a clue as to whether they'll have to hold on to their hats or not!



You Just Spin Me Around

In the **northern hemisphere**, wind blows clockwise around high pressure and anticlockwise around low pressure. But in the **southern hemisphere**, that's reversed! This is due to the **Coriolis effect**, where the spinning motion of Earth causes wind to be deflected (curve) to the right in the northern hemisphere and to the left in the southern hemisphere.

Wherever the Wind Blows

If you know the direction that the wind is coming from, you can work out the weather that it's bringing your way. For example, if you live in Europe and have a northerly wind in winter, it'll come from the **Arctic**, so it'll bring cold air and possibly snow. If there's a southerly wind in summer then it'll come from Africa, bringing hot air, clear skies and perhaps even thunderstorms.

If the air pressure changes a lot over a short distance, then you're in for strong wind.

If the same change happens over a longer distance, the wind doesn't move so fast, so it's weaker.

How Are Your Grades?

The strength of the wind depends on how much the air pressure changes over distance. This change is called the 'pressure gradient'.

LIGHTNING

A SHOCK TO THE SYSTEM

Sparks of electrically charged bright light that flicker across the sky – some striking the ground, some stretching towards other clouds. Lightning is both fascinating and scary at the same time. Whilst it has the ability to momentarily turn night into day, it can be deadly and damaging if it hits an object on the ground.

Lightning is caused by the collision of ice crystals and hail within a cumulonimbus cloud in a thunderstorm, which gives the bottom of the cloud a negative charge. The ground and the top of the cloud end up with a positive charge.

Eventually, the negative and positive charges build up so much that lightning – a huge spark of electricity – is released. The lightning hits either the ground, tall objects or other clouds.

Gone in a Flash

A lightning strike travels at a speed of around 435,000 kilometres per hour. At this speed, it would take just 46 seconds to travel from London to New York. London to Sydney would take only two minutes and 21 seconds.

Thundering Past

As lightning travels through the air, it rapidly heats it up. This causes the air to expand and a shockwave to be created, which is what we hear as thunder.

First Light

Light travels much, much faster than sound. Therefore, it takes longer for the sound of thunder to reach us, compared to the flash of light. The further you are from the lightning flash, the longer it takes to hear the thunder.

Hot Shot

The electrical discharge from lightning is so intense that it can reach a temperature of 30,000 degrees Celsius, which is five times hotter than the surface of the sun!

Striking the Hour

On average, there are almost four million lightning strikes on Earth each day. That's around 158,400 every hour, or 44 strikes per second!

Blasting the Tree

When lightning strikes a tree, it is often destroyed. Lightning instantly and intensely heats up water and sap inside the tree, causing it to rapidly expand. This often causes the bark of the tree to be blown away and the wood inside to split.

BOLT-CANO

Volcanoes cause lightning as well. When they erupt, they throw up huge clouds of rock and ash into the sky. Differences in electrical charge happen in the same way as with ice in a cloud – eventually leading to lightning strikes.

PRECIPITATION

WATERING OUR PLANET

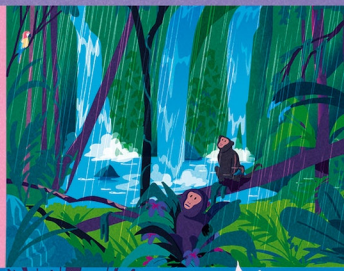
Precipitation is any form of water that falls from the sky – be it rain, snow, hail or a mixture of them all. It's nature's clever way of moving large amounts of water from one location to another. Moisture in the air rises and condenses to form clouds in one place, before they drift away and deposit it elsewhere. How this water is distributed determines the landscape and climate of an area – such as where luscious, moisture-rich rainforests or barren, parched deserts are found.

The type and amount of **precipitation** that falls in any one place can have a big effect on our daily lives. Heavy snow can look pretty and mean a day off school, but it can cause lots of disruption to travel and infrastructure – such as electricity supplies. Hail may be interesting to watch, but if the hailstones are big enough, they can damage roofs or smash windows. Impacts from precipitation tend to be greatest when there's either too much or not enough of it.

Rain

Despite rain being the most familiar type of precipitation, there are lots of interesting facts about it that people don't know!

Raindrops vary a lot in size. The smallest ones, like a fine spray, have a diameter as little as 0.2 millimetres. The biggest ones, found in tropical regions, have a diameter around 5 millimetres. It's not just their size that varies, but also their speed. Raindrops typically fall at 11-32 kilometres per hour. However, the smallest, finest drops fall more slowly, at around 5 kilometres per hour.



Snow

Snow is easily the prettiest precipitation. Snowflakes of varying shapes and sizes gently descend at around 1-6 kilometres per hour, turning the landscape into a winter wonderland. Due to the way in which ice crystals create snowflakes, they are all hexagonal – with six sides or points – but are also unique. Every flake has its own pattern. Snow is often described in two ways – either wet and sticky, which is good for making snowballs, or dry and powdery, which is good for skiing.

Hail

Hail can have quite a journey before it hits the ground. Inside a thunderstorm, hailstones are carried up and down by air currents, accumulating another layer of ice each time. This means that if you slice a hailstone in half, it resembles an onion with its individual layers.

Small hailstones fall at 15-40 kilometres per hour. But the biggest ones can fall as fast as 115 kilometres per hour!

In the most severe thunderstorms, hailstones as big as golf balls and baseballs have been recorded, which can cause a lot of damage when they reach the ground!